Longitudinal Effects of Human Supremacy Beliefs and Vegetarianism Threat on Moral Exclusion (*vs*. Inclusion) of Animals

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Abstract

Stronger beliefs in human supremacy over animals, and stronger perceived threat posed by vegetarianism to traditional practices, are associated with stronger speciesism and more meat consumption (Dhont & Hodson, 2014). Both variables might also be implicated in the moral exclusion of animals. We tested this potential in a 16-month longitudinal study in the USA (N = 219). Human supremacy showed longitudinal effects on the moral exclusion of all animals. Vegetarianism threat only predicted moral exclusion of food animals (e.g., cows and pigs), and, unexpectedly, appealing wild animals (e.g., chimps and dolphins). These findings demonstrate the importance of both human supremacy and perceived threat in explaining moral exclusion of animals and highlight potential paradoxical negative consequences of the rise of vegetarianism.

[120 words]

Keywords: human supremacy beliefs, vegetarianism threat, moral exclusion, human-animal relations, moral concern

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Anecdotal evidence suggests that there exists a double standard in how people treat animals depending on whether they are traditionally food animals, companion animals, or other type of animals. Specifically, people love some animals but exploit others despite them being very similar. This difference is particularly accentuated when we compare pets to farm animals in western civilizations (Herzog, 2010; Joy, 2010). Animal rights advocates and organizations have repeatedly flagged this moral inconsistency in an attempt to encourage people to acknowledge the similarities between pets and farm animals. For example, a Mercy for Animals campaign featured pets alongside farm animals with the slogan "Why love one but eat the other?". Presently unknown, however, are the psychological factors that influence how people choose the animals included in their moral circles.

Two key variables relevant for understanding support for animal exploitation and consumption are: (a) beliefs in human supremacy over animals (Dhont & Hodson, 2014); and (b) perceived threat posed by non-traditional ideologies (e.g., vegetarianism) advocating for abandoning meat consumption and the exploitation of animals (i.e. vegetarianism threat, see Dhont & Hodson, 2014; Dhont, Hodson, & Leite, 2016). Both human supremacy beliefs and vegetarianism threat show meaningful positive associations with frequency of meat consumption and acceptance of animal exploitation, even after controlling for the desire to eat meat (Dhont & Hodson, 2014). Thus ideologically-motivated beliefs play a critical role in explaining support for animal exploitation and consumption and are likely implicated in considerations about whether animals are worthy of moral concern.

However, the effects of human supremacy beliefs and vegetarianism threat have rarely been studied, and the extent to which these psychological beliefs are associated with

the moral exclusion of different categories of animals remains unknown. Furthermore, extant studies relied solely on cross-sectional designs, limiting the conclusions that can be drawn from the findings. Indeed, a strict longitudinal test is essential for a comprehensive analysis of the predictive role of these variables on moral concern for animals. This paper addresses both issues.

Human Supremacy and Vegetarianism Threat

Historically, humans have treated (non-human) animals as their inferiors. The condescending way that humans treat animals has been conceptualized as a desire for domination (Tuan, 1984), reflecting *beliefs in human superiority over animals* (Dhont & Hodson, 2014). Endorsing human supremacy beliefs can serve a legitimizing purpose to justify hierarchical human-animal relations and the exploitation of animals for human benefits (Dhont & Hodson, 2014; Hyers, 2006), akin to how hierarchy-enhancing legitimizing myths justify and promote social inequality and the oppression of low-status groups in human intergroup relations (see Hodson & Dhont, 2015; Sidanius & Pratto, 1999). In line with this idea, stronger endorsement of human-animal inequality and human supremacy beliefs are associated with more meat consumption, and with stronger support for animal exploitation (Dhont & Hodson, 2014). Furthermore, deemphasizing the hierarchical divide between animals and humans has been shown to expand moral inclusivity of animals and to reduce speciesism (Bastian, Costello, Loughnan, & Hodson, 2012; see also Amiot, Sukhanova, Greenaway, & Bastian, 2017). In sum, accumulating evidence suggests that beliefs in human supremacy are associated with *general* negative attitudes towards animals, similar to the general effects of social dominance orientation across human outgroups (Kteily, Ho, & Sidanius, 2012; Meeusen & Dhont, 2015).

Yet the way that certain animals are perceived and treated might also be driven by perceived threat that arises in response to the growth of non-traditional ideologies and

practices that defy the dominant meat-eating traditions. Most people feel uneasy when their habits or customs are threatened (Allport, 1954; Stephan & Renfro, 2002). For instance, intergroup relations research demonstrates that perceived threats to the ingroup's norms increase negative outgroup attitudes (Riek, Mania, & Gaertner, 2006; Stephan & Renfro, 2002). The rise of non-traditional or non-normative ways of treating or relating to animals (e.g., vegetarianism), might pose a subjective threat to those that see meat consumption as central in their culture - *vegetarianism threat* (Dhont & Hodson, 2014; Dhont et al., 2016).

MacInnis and Hodson (2017) showed that heightened perceptions of vegetarianism threat are associated with more negative attitudes towards vegetarians and vegans. Vegetarianism threat has also been associated with more meat consumption and greater support for animal exploitation (Dhont & Hodson, 2014), as well as with justifications for meat consumption and the derogation of animals (Monteiro, Pfeiler, Patterson, & Milburn, 2017). This is consistent with research showing that heightened perceived threat posed by environmentalists to the Western way of life (i.e. environmentalist threat) is associated with stronger denial of climate change and less support for environmentally-friendly policies (Hoffarth & Hodson, 2016). That is, environmentalist threat triggers a pushback against the environment itself (see also Gromet, Kunreuther, & Larrick, 2013). Together, these findings suggest that threats posed by unconventional movements and ideologies that challenge the dominant ways of treating nature or animals might paradoxically worsen the attitudes and reactions towards the targets these movements aim to defend. Therefore, vegetarianism threat might have negative effects on moral exclusion of animals, particularly those that vegetarian and vegan movements are set to protect – food animals.

Given that both human supremacy beliefs and vegetarianism threat are associated with negative attitudes (i.e. speciesism) and behavior (i.e. meat consumption) towards animals (Dhont & Hodson, 2014), we argue that both concepts likely play a critical role in

explaining moral exclusion of animals. Specifically, we suggest that over time these ideologically-motivated beliefs about human-animal relations predict moral exclusion of animals more than the converse.

The Psychology of Moral Concern for Animals

People treat others with fairness particularly when included within the psychological boundaries that define who is worthy of fair treatment (Opotow, 1990; Opotow, Gerson, & Woodside, 2005) and moral consideration (i.e. *moral circles*, Crimston, Bain, Hornsey, & Bastian, 2016; Laham, 2009; Singer, 1981). Those who fall outside these boundaries are morally excluded and are often targets of exploitation, deprivation, or largely ignored. Indeed, not all animals are perceived as worthy of moral consideration. The *meat paradox* illustrates how people can be concerned for animal welfare in *general* and yet support exploitative practices towards *specific* animal categories, such as through meat consumption (Bastian & Loughnan, 2017; Loughnan, Bratanova, & Puvia, 2012).

To date, most research on moral concern for animals has focused on the distinction between food and non-food animals. For example, Bratanova, Loughnan, and Bastian (2011) demonstrated that different moral concern is applied to animals depending on whether they are considered edible. However, further distinctions can be made between animals that can theoretically lead to different levels of exclusiveness (*vs.* inclusiveness) in moral circles. For example, companion animals (e.g., dogs and cats) usually receive special treatment and hold a high status relative to other animals (Herzog, 2010; Hodson, MacInnis, & Costello, 2014; Joy, 2010). Likewise, wild animals such as chimpanzees are usually perceived to have a high status given their high capabilities, perceived similarities to humans (Batt, 2009; Gray, Gray, & Wegner, 2007; Hodson et al., 2014; Plous, 1993), and their general strong appeal relative to other wild species (Veríssimo et al., 2017). Other types of wild animals (e.g., snails and snakes) are less similar to humans and perceived to be less appealing, based on aesthetical

characteristics and the emotional reaction they trigger (e.g., fear and disgust) (Batt, 2009; Knight, 2008; Veríssimo et al., 2017). Such animals are deemed of low status and likely considered less worthy of moral consideration (Batt, 2009; Gray et al., 2007), with consequences for attitudes towards their welfare and protection (Veríssimo et al., 2017).

There is thus accumulating evidence illustrating the double standard that underlies individuals' differential moral judgment and behaviors towards different animal categories. Extending this body of work, we investigate the role of ideologically-motivated beliefs about human-animal relations (i.e. human supremacy beliefs and vegetarianism threat) in predicting moral exclusion (*vs*. inclusion) of different animal categories.

Overview and Hypotheses

We employed a longitudinal design to test the effects of human supremacy beliefs and vegetarianism threat on the moral inclusion of different animal categories over time amongst USA respondents. The use of a cross-lagged model allowed us to investigate the simultaneous effects of these ideologically-motivated beliefs on moral inclusion of different animal categories over time, providing some insights into the direction of the associations between variables, while controlling for autoregressive paths.

Drawing on previous evidence highlighting that the perceived moral status of animals reflects the relation that people have with them, we hypothesize that an animal's social status will be an important determinant of whether an animal will be morally included. Specifically, we expect that high status animals (companion and appealing wild animals) will be more morally included than low status animals (food and unappealing wild animals).

Moreover, we expect human supremacy beliefs and vegetarianism threat to have differential effects on moral exclusion of animals. Given that human supremacy beliefs reflect a general belief in the superior status of humans over all other species, we expect that greater endorsement of human supremacy beliefs will predict moral exclusion of all animal

categories. In contrast, we expect that the effects of vegetarianism threat will vary as a function of animal category. More specifically, considering that vegetarian ideologies are seen to defend the rights of *food* animals, we expect perceived vegetarianism threat to predict moral exclusion of this category in particular.

Method

Participants and Procedure

A sample of USA participants was recruited via Amazon Mechanical Turk (see Burhmester, Kwan, & Gosling, 2011) and invited to complete an online survey including measures of human supremacy beliefs, vegetarianism threat, and moral inclusion of different animals. A total of 402 participants completed the survey at Time 1, 210 male and 192 female, ranging from 20 to 74 (M_{age} = 39.26, *SD* = 13.19) years of age. They were each paid US $0.60. All participants were invited to complete the same survey again after 16 months (Time 2). A total of 223 participants responded at follow-up. Of these, four did not finish the survey and were therefore excluded from the analyses, resulting in a final sample of 219 respondents (115 male, 104 female, ranging from 21 to 76 years of age, M_{age} = 42.92, *SD* = 13.22). When asked about diet 76.3% of the participants self-identified as omnivore/meat-eater, 13.7% semi-vegetarian/flexitarian, 3.7% pescetarian/ no meat but consume fish, 4.6% vegetarian, 1.8% vegan. Finally, we asked participants to indicate how frequently they ate meat (*1 = never, 7 = every meal*) (*M* = 4.71, *SD* = 1.33). Ethical approval was obtained from the ethics committee of the School of Psychology at the University of Kent.

Measures

Participants completed the six items of the human supremacy beliefs scale developed by Dhont and Hodson (2014) on 7-point scales (e.g., “The life of an animal is just not of equal value as the life of a human being”; *1 = strongly disagree; 7 = strongly agree*), showing high internal consistency, Cronbach’s α_{T1} = .92 and α_{T2} = .93. Vegetarianism threat

was assessed with eight items (e.g., "The rise of vegetarianism poses a threat to our country's cultural customs"; *1 = strongly disagree; 7 = strongly agree*; Dhont & Hodson, 2014; Dhont et al., 2016), with high internal consistency, Cronbach's α_{T1} = .90 and α_{T2}= .91.[1]

To measure moral inclusion of animals we used Laham's (2009) moral circle task. Participants were presented with a list of 20 animals belonging to one of four categories: high status companion animals, high status appealing wild animals, low status food animals, and low status unappealing wild animals[2] (see Table 1). They were given the following instructions (Laham, 2009, p. 251): "When we think about animals in the world, we might feel a moral obligation to show concern for the welfare and interests of some of those animals. Below is a list of animals. Please select those that you feel morally obligated to show concern for" (0 = not selected, 1 = selected). A factor analysis with direct oblimin rotation revealed four factors (see Table 1), which explained 73.62% of the total variance. The four factors matched the expected categories of animals representing moral inclusion of a) food animals (e.g., chicken, pig), b) companion animals (e.g., cat, dog), c) appealing wild animals (e.g., dolphin, chimp), and d) unappealing wild animals (e.g., snake, snail). For each category, the proportion of selected animals was used as participants' moral inclusion score (Cronbach's α_{T1}: .96, .77, .85, and .96; α_{T2} = .97, .71, .86, and .95, respectively).

Results

We first conducted a MANOVA on all the variables of interest measured at Time 1 (human supremacy beliefs, vegetarianism threat, and moral inclusion) to assess whether participants who participated at both time points did not differ significantly in these variables from those who dropped out. Results revealed no significant differences, F (6, 395) = 0.55, p = .770, partial η^2 = .008; as such, selective dropout was an unlikely explanation for subsequent findings. Table 2 presents the descriptive statistics and correlations between

variables. Human supremacy beliefs and vegetarianism threat were significantly associated with less moral inclusion of all animal categories within and across time points.

Table 1 presents the average moral inclusion judgements for each animal, and Figure 1 presents the percentages of moral inclusion of each animal category. As expected, the percentages of inclusion are overall higher for high status animals than for low status animals. We used paired-samples *t*-tests to compare moral inclusion of different animal categories. Participants were more inclusive of companion animals than any other animal category both at Time 1 and Time 2, all *t*s $(218) \geq 5.92$, $p < .001$, $d = 0.42$ (see Figure 1). Furthermore, appealing wild animals were more morally included than both food and unappealing wild animals, all *t*s $(218) \geq 7.50$, $p < .001$, $d = 0.51$. Food animals were still more likely to be morally included than unappealing wild animals, both at Time 1 and Time 2, *ts* $(218) \geq 6.72$, $p < .001$, $d = 0.45$.

To investigate the longitudinal relations between human supremacy beliefs, vegetarianism threat, and moral inclusion of food animals, companion animals, appealing and unappealing wild animals, we tested a cross-lagged model using SEM with latent variables in Mplus (Version 7.1, Muthén & Muthén, 1998-2013). Items were averaged into parcels to attenuate measurement error. We created three parcels each for human supremacy beliefs, vegetarianism threat, moral inclusion of food animals, and unappealing wild animals. We created two parcels for moral inclusion of appealing wild animals. The observed score was used for moral inclusion of companion animals, given that only three animals were included in this category.

To check whether the measurement model remained stable over time we first conducted longitudinal metric invariance testing. Specifically, we compared a longitudinal measurement model with freely estimated parameters with a model in which factor loadings of parallel indicators were constrained to be equal over time (i.e. defined to be invariant) (cf.

Brown, 2006; Christ & Wagner, 2013). This model comparison showed no significant differences between the constrained, X^2 (336) = 436.08, $p < .001$, and unconstrained model, X^2 (327) = 432.48, $p < .001$, $\Delta\chi^2 = 3.60$, $df = 9$, $p = .936$, supporting the assumption that the measurement properties of our measures remained stable over time.

Having established longitudinal measurement invariance, we then tested a cross-lagged model that included paths from both human supremacy beliefs and vegetarianism threat at Time 1 to each moral inclusion variable at Time 2. Furthermore, we included all autoregressive paths for each variable as well as the cross-lagged paths from the moral inclusion variables at Time 1 to human supremacy beliefs and vegetarianism threat at Time 2 (see Figure 2). The model fit the data well, X^2 (348) = 469.40, $p < .001$; *RMSEA* = .04, *CFI* = .98, *TLI* = .98, *SRMR* = .04.

As expected, the effects of human supremacy beliefs were general or diffuse, predicting moral inclusion of food animals (e.g., pig, cow, chicken) (β = -.22, p = .001, 95%CI [-.35, -.10]), companion animals (e.g., dog, cat) (β = -.25, $p < .001$, 95%CI [-.38, -.11]), appealing wild animals (e.g., dolphin, bear) (β = -.20, p = .005, 95%CI [-.33, -.06]), and unappealing wild animals (e.g., snake, snail) (β = -.18, p = .005, 95%CI [-.31, -.05]). In contrast, vegetarianism threat only significantly predicted moral inclusion of food animals (β = -.14, p = .036, 95%CI [-.27, -.10]) and appealing wild animals (β = -.18, p = .010, 95%CI [-.32, -.05]), not of companion animals (β = .03, p = .670, 95%CI [-.11, .17]) or unappealing wild animals (β = -.08, p = .210, 95%CI [-.21, .05]) (see Figure 2 and Table 3)[3]. In other words, stronger beliefs in human supremacy were associated with more moral exclusion of all categories of animals over time. In contrast, stronger perceptions of vegetarianism threat were only associated with more moral exclusion of appealing wild animals and food animals over time. Importantly, none of the moral inclusion variables predicted human supremacy

beliefs or vegetarianism threat over time; that is, human superiority and vegetarianism threat predicted moral inclusion/exclusion but the reverse pattern was not supported longitudinally.

Discussion

Moral obligation towards animals varies widely as a function of how an animal is perceived, its functional role in society, and its relationship with humans. For instance, the vast majority of our respondents (90%) felt morally obliged to show concern for the welfare and interests of dogs (a companion animal), but only 51% felt the same about pigs (a food animal). We investigated, for the first time, the role of ideologically motivated beliefs related to human-animal relations in predicting moral exclusion of distinct animal categories over time. The results demonstrated that stronger human supremacy beliefs and vegetarianism threat predicted inclusion of fewer animals in individuals' moral circles over a reasonably large time interval. More specifically, in line with our hypotheses, human supremacy beliefs predicted moral exclusion of all animal categories under investigation. That is, the stronger the dominance beliefs the more likely appealing and unappealing wild animals, companion animals, and food animals are being morally excluded. However, as expected, the effects of vegetarianism threat were more specific and only emerged for certain animal categories. Stronger vegetarianism threat predicted lesser moral inclusion of food animals, but not of companion animals and unappealing animals. Of note, this effect emerged above and beyond the effects of human supremacy beliefs. Interestingly, yet rather unexpected, vegetarianism threat also longitudinally predicted less moral inclusion of appealing wild animals. Taken together, our findings demonstrate the importance of human supremacy beliefs and vegetarianism threat for the way people think morally about animals. We will discuss these findings in light of the intergroup relations literature.

Beliefs in Human Supremacy over Animals and Moral Exclusion of Animals

Human supremacy beliefs can serve as legitimizing myths to preserve hierarchy in human-animal relations and result in negative attitudes towards animals (Dhont & Hodson, 2014). Our findings suggest that they can also perpetuate the exclusion of animals from moral circles of concern. The general impact of human supremacy beliefs on moral exclusion of all animals finds parallels in the generalized effects typically observed for social dominance orientation, reflecting the extent to which an individual prefers social inequality and hierarchy in (human) groups (Pratto, Sidanius, Stallworth, & Malle, 1994; Sidanius & Pratto, 1999). For instance, those higher in social dominance orientation are not only more likely to endorse racist attitudes (Hodson & Costello, 2007), they are also more likely to endorse sexist and homophobic attitudes (Kteily et al., 2012; Meeusen & Dhont, 2015; Whitley, 1999; Zick et al., 2008) as well as speciesist attitudes (Caviola, Everett, & Faber, in press; Dhont et al. 2014, 2016). The present findings thus provide further support for the similarities between support for inequality in human-human and human-animal relations, by showing that beliefs in superiority over animals have negative effects that generalize across different animal categories in similar ways as social dominance orientation has generic effects on attitudes towards human outgroups.

Vegetarianism Threat and Moral Exclusion of Animals

The present findings are also consistent with research on (human) intergroup threat showing that the effects of intergroup threat on outgroup attitudes can vary according to outgroups (e.g., Stephan & Stephan, 2000). Even though our study did not focus on different sources of outgroup threat, it provides support for the overall idea that the effects of vegetarianism threat vary depending on whether the animal category is protected by social movements that threaten cultural traditions. The effect of vegetarianism threat on the moral exclusion of food animals further illustrates that the pushback against the rise of vegetarianism goes well beyond the negative attitudes towards the initial source of threat -

vegetarians and vegans (MacInnis & Hodson, 2017). This is also well-illustrated by a popular bumper stick in the USA: “I didn’t claw my way to the top of the food chain to eat vegetables!”, which suggests that legitimization of human-animal domination reflects the idea of an acquired entitlement to rule over animals that is being threatened by the rise of vegetarianism.

The idea that perceived vegetarianism threat can lead to an unintended pushback against both animals and vegetarians, is similar to how environmentalism threat predicts the denial of climate change (Hoffarth & Hodson, 2016). Together these findings suggest that the perceived threat that arises from movements that defy traditional practices of exploiting nature and animals might to a certain extent lead to more exploitative attitudes and behaviors possibly as a result of the need to protect cultural norms and traditions and a resistance to change.

Although unexpected, the significant association between vegetarianism threat and moral exclusion of appealing wild animals (e.g., chimps, dolphins) could indicate that vegetarianism is also perceived as a threat to values beyond those related to eating habits. Indeed, given the environmental benefits of reducing meat consumption, vegetarianism might not solely trigger feelings of threat by questioning traditional dietary habits, but also be perceived as a broader threat towards exploitative environmental and anti-conservation practices. In fact, appealing wild animals are often flagship species (i.e. ambassadors) in marketing campaigns to raise awareness and funds to biodiversity conservation (Veríssimo, MacMillan, & Smith, 2011) and may symbolize these campaigns. The effects of vegetarianism threat on the moral exclusion of appealing wild animals may thus reflect a push back against these animals due to perceived environmentalism threat.

Limitations and Future Research Directions

Like all research, our project has limitations. Specifically, although commonly employed in the field, the use of cross-lagged panel models might not fully account for the stability of a trait-like, time-invariant nature (Hamaker, Kuiper, & Grasman, 2015). The inclusion of random intercepts in longitudinal models can address this issue but requires three or more waves of data. Hence, future research is needed to further test the robustness of the present findings in a three (or more)-wave longitudinal study.

Our results suggest that the double standard in the moral inclusion of different animal categories depends on the status that they hold and their perceived role and functional purpose in society. However, given that decisions on moral inclusivity may be based on aspects such as physical characteristics (e.g., cuteness) or emotional reactions to animals (e.g., disgust), future research is needed to fully understand the emotional and motivational aspects underlying the moral inclusion of different animals.

Furthermore, previous research found that "food" animals are ascribed less cognitive capabilities and less secondary emotions than other "non-edible" animals, suggesting that cognitive dissonance comes into play when individuals judge the capabilities of animals that they consume for food (Bastian, Loughnan, Haslam, & Radke, 2012; Bilewicz, Imhoff, & Drogosz, 2011; Piazza & Loughnan, 2016). Specifically, disengaging from the origins of meat might serve the purpose of reducing the dissonance that might arise when people enjoy meat but are uncomfortable about harming animals (Bastian et al., 2012; Kunst & Hohle, 2016). This process has been shown to reduce the attribution of intelligence (Bastian et al., 2012) and secondary emotions (Bilewicz et al., 2011) to "food" animals. In line with this idea, our results indicate that food animals are pushed out of people's moral circles, and even more so among those who strongly believe in human superiority over animals or feel threatened by the rise of vegetarianism. Although not directly tested in the present study, it is likely that cognitive dissonance plays an important role in explaining why humans

specifically push food animals out of their moral circles. Further research is necessary to test this idea.

Similarly, future research could explore how differential moral inclusivity of animals varies cross-culturally. The results discussed in this paper are specific to the US context. Although we anticipate that the overall conceptual pattern would hold across cultures, specific animals comprising the categories would be likely to vary across cultures. For example, whereas here kangaroos belonged to the appealing wild animals, they might be categorized as food animals or unappealing wild animals and hold a lower status in Australia.

Finally, future research can also manipulate similarities between humans and different animals to investigate the effects on attitudes towards different animal categories as well as prejudice towards human outgroups. Previous research has shown that human supremacy beliefs are associated with human outgroup prejudice via outgroup dehumanization (Costello & Hodson, 2010, 2014a, 2014b; Hodson et al., 2014). Increasing the similarity between humans and animals can, however, effectively reduce (human) outgroup prejudice by eliminating the derogatory animalistic comparison at its roots (Costello & Hodson, 2010) and expands individuals' circle of moral concern for animals (Bastian et al., 2012). This research line could be extended by investigating the effects of increasing similarities between humans and different animal categories.

Conclusion

The present research contributes to the growing body of psychological research on human-animal relations (Amiot & Bastian, 2015) and provides further evidence for the parallels between the roles that dominance and threat play in human-human relations and human-animal relations. The present research provides the first longitudinal test of human supremacy beliefs and vegetarianism threat on the moral exclusion of animals, and supports

the assertion that ideological-motivated variables about human-animal relations precede moral exclusion of animals rather than the converse.

Footnotes

[1]The measures were part of a larger survey with variables not used in the present study. All the measures and data used in this paper are openly available at the Open Science Framework (https://osf.io/2mkvu).

[2]To simplify, we will refer to these categories as companion, appealing wild, food, and unappealing wild animals.

[3]To rule out the possibility that the effects were driven by the possible confounding role of participants' meat consumption habits, we tested a model in which we controlled for frequency of meat consumption (at Time 1). The data fit the model well, X^2 (366) = 487.44, p < .001; *RMSEA* = .04, *CFI* = .98, *TLI* = .98, *SRMR* = .04. Results show that the effects of human supremacy beliefs and vegetarianism threat still hold. Specifically, stronger beliefs in human superiority over animals were longitudinally associated with less moral inclusion of food animals (β = -.22, p = .001, 95%CI [-.35, -.09]), companion animals (β = -.25, p < .001, 95%CI [-.39, -.11]), appealing wild animals (β = -.20, p = .006, 95%CI [-.34, -.06]), and unappealing wild animals (β = -.16, p = .015, 95%CI [-.29, -.03]). Furthermore, stronger vegetarianism threat was longitudinally associated with less moral inclusion of food animals (β = -.14, p = .043, 95%CI [-.27, -.004]), and appealing wild animals (β = -.19, p = .010, 95%CI [-.33, -.04]), only. Noteworthy, none of the moral inclusion variables at Time 1 were associated with human supremacy beliefs or vegetarianism threat at Time 2.

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Table 1. Percentage of moral inclusion of each animal and results of factor analysis with direct oblimin rotation for moral inclusion items (Time 1).

		Low Status		High Status	
	Moral inclusion (mean %)	Food Animals (Factor 1)	Unappealing Wild Animals (Factor 2)	Appealing Wild Animals (Factor 3)	Companion Animals (Factor 4)
Chicken	49%	**.95**	-.09	-.08	-.08
Goat	53%	**.89**	-.01	-.04	.05
Sheep	55%	**.86**	.06	.06	.07
Pig	51%	**.84**	-.03	.08	.02
Turkey	46%	**.83**	-.19	-.08	-.02
Cow	58%	**.79**	.06	.16	.06
Duck	55%	**.54**	-.19	.11	.11
Snake	31%	-.02	**-.97**	-.02	.03
Snail	29%	.03	**-.93**	-.09	.02
Starfish	38%	-.08	**-.88**	.12	.03
Crocodile	36%	.02	**-.85**	.10	<.01
Bat	38%	.20	**-.70**	.06	-.04
Frog	39%	.19	**-.69**	.03	.06
Dolphin	79%	-.10	-.06	**.80**	-.01
Chimp	76%	.12	<.01	**.69**	<.01
Bear	62%	.14	-.16	**.62**	.07
Kangaroo	60%	.26	-.15	**.43**	.14
Cat	81%	.04	-.02	.05	**.72**
Dog	90%	-.05	-.06	-.09	**.69**
Horse	77%	.23	.14	.28	**.58**

Table 2. Correlations, Means and Standard Deviations.

	1	2	3	4	5	6	7	8	9	10	11	12
1. Human supremacy T1												
2. Human supremacy T2	.86***											
3. Vegetarianism threat T1	.37***	.42***										
4. Vegetarianism threat T2	.35***	.37***	.70***									
5. Moral inclusion of food animals T1	-.35***	-.37***	-.32***	-.24***								
6. Moral inclusion of food animals T2	-.39***	-.43***	-.33***	-.32***	.52***							
7. Moral inclusion of unappealing wild animals T1	-.37***	-.37***	-.36***	-.30***	.75***	.55***						
8. Moral inclusion of unappealing wild animals T2	-.36***	-.40***	-.31***	-.22**	.50***	.79***	.63***					
9. Moral inclusion of appealing wild animals T1	-.33***	-.34***	-.35***	-.29***	.69***	.42***	.61***	.36***				
10. Moral inclusion of appealing wild animals T2	-.37***	-.42***	-.36***	-.32***	.41***	.75***	.45***	.65***	51***			
11. Moral inclusion of companion animals T1	-.17*	-.16*	-.20**	-.18**	.57***	.22**	.40***	.22**	54***	27***		
12. Moral inclusion of companion animals T2	-.29***	-.30***	-.13*	-.14*	.27***	.54***	.28***	.41***	37***	62***	37***	
M (SD)	4.21(1.73)	4.17(1.80)	2.69(1.30)	2.64(1.36)	.52(.45)	.57(.46)	.35(.44)	.44(.45)	.69(.38)	.74(.37)	.83(.31)	.88(.26)

Notes * $p < .05$. ** $p < .01$. ***$p < .001$; potential scores on moral inclusion variables could range from 0 to 1.

Table 3. Cross-lagged model testing the longitudinal associations between human supremacy, vegetarianism threat, and moral inclusion (MI) of the four animal categories.

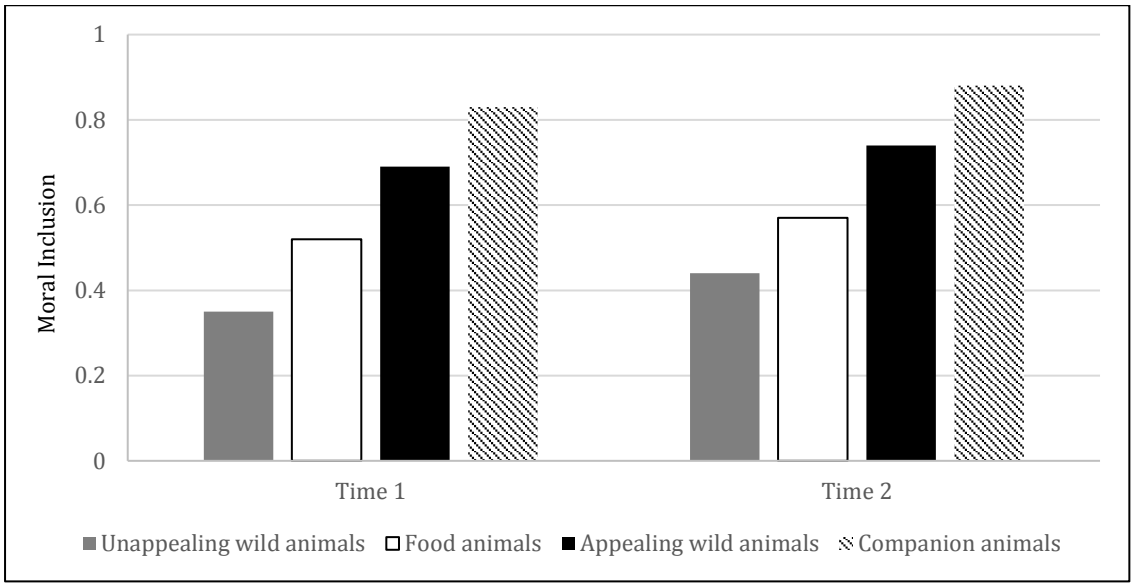
Time 1	Time 2	β [95% CI]	p
Human supremacy	Human supremacy	.84 [.777, .893]	< .001
	Vegetarianism threat	.13 [.013, .250]	.030
	MI of food animals	-.22 [-.349, -.094]	.001
	MI of companion animals	-.25 [-.382, -.113]	< .001
	MI of appealing wild animals	-.20, [-.332, -.059]	.005
	MI of unappealing wild animals	-.18 [-.307, -.054]	.005
Vegetarianism threat	Human supremacy	.10 [.020, .185]	.015
	Vegetarianism threat	.68 [.575, .776]	< .001
	MI of food animals	-.14 [-.269, -.009]	.036
	MI of companion animals	.03 [-.109, .170]	.670
	MI of appealing wild animals	-.18 [-.322, -.045]	.010
	MI of unappealing wild animals	-.08 [-.213, .047]	.210
Moral inclusion of food animals	Human supremacy	-.06 [-.200, .087]	.440
	Vegetarianism threat	.10 [-.113, .306]	.369
	MI of food animals	.37 [.278, .468]	< .001
Moral inclusion of companion animals	Human supremacy	.04 [-.047, .127]	.365
	Vegetarianism threat	-.06 [-.191, .062]	.320
	MI of companion animals	.35 [.253, .452]	< .001
Moral inclusion of appealing wild animals	Human supremacy	-.03 [-.160, .107]	.697
	Vegetarianism threat	-.01 [-.203, .184]	.922
	MI of appealing wild animals	.37 [.262, .484]	< .001
Moral inclusion of unappealing wild animals	Human supremacy	.02 [-.096, .143]	.701
	Vegetarianism threat	-.04 [-.213, .136]	.664
	MI of unappealing wild animals	.47 [.365, .573]	< .001

Figure Legends

Figure 1. Mean levels of moral inclusion of different animal categories at Time 1 and Time 2.

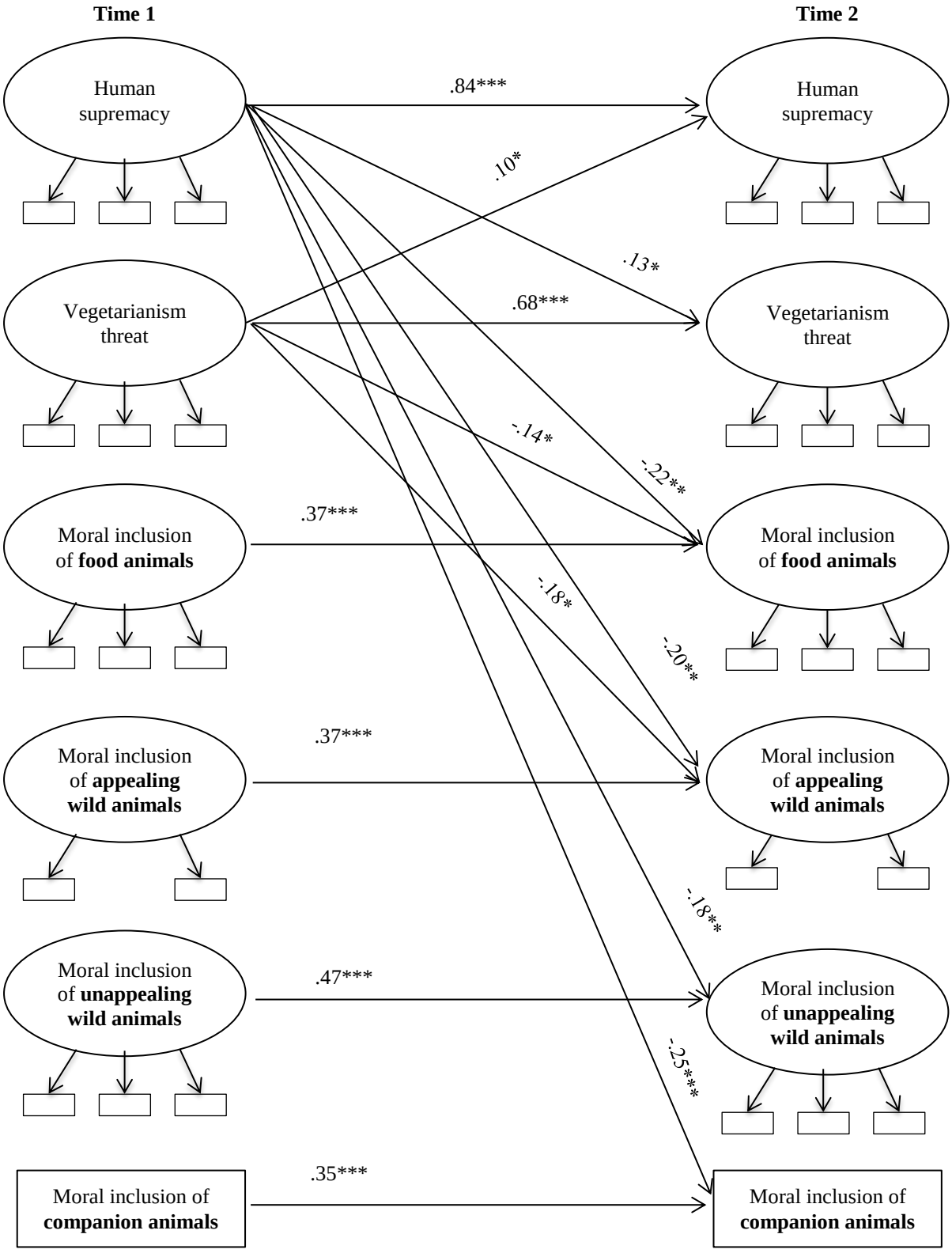
Figure 2. Cross-lagged model testing the longitudinal associations between human supremacy, vegetarianism threat, and moral inclusion of the four animal categories.

Figure 1. Mean levels of moral inclusion of different animal categories at Time 1 and Time 2.



Note: All means significantly differed from each other (*p*s < .001) within each time frame.

Figure 2.



Notes: All coefficients are standardized. All variables were allowed to correlate within each time point.
* p <.05; ** p < .01; *** p < .001.